



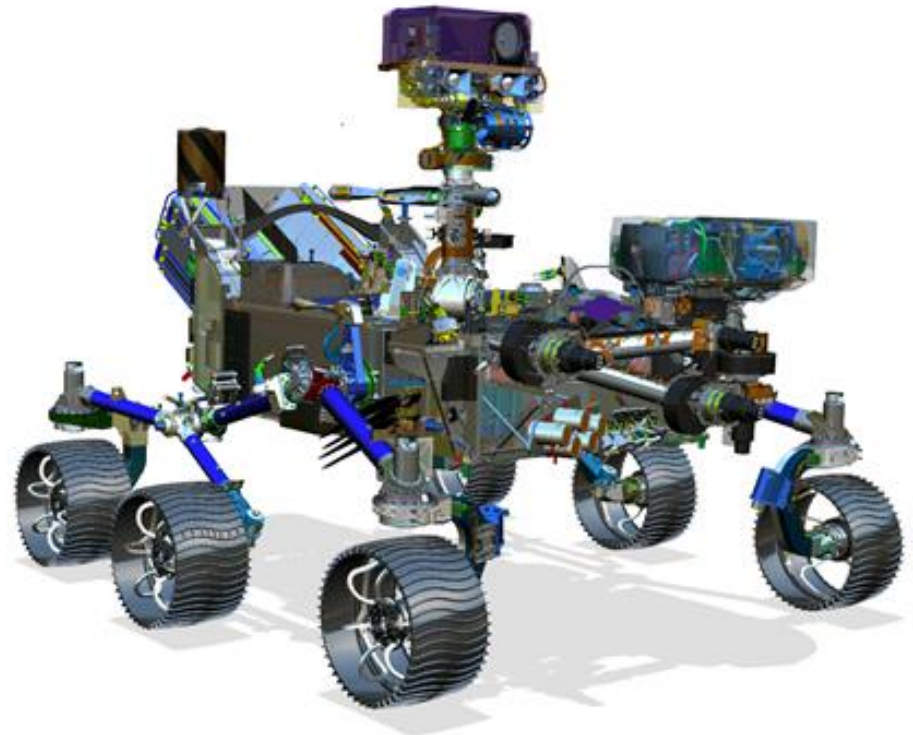
# Mars 2020 Overview:

## Mars Exploration Program Advisory Group

**Matt Wallace**

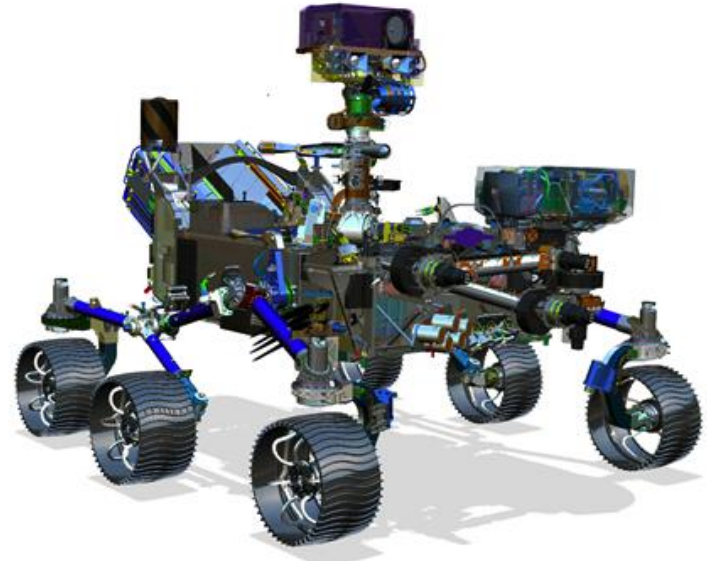
Mars 2020 Deputy Project Manager

February 22, 2017



## Salient Features

- *Category: 1*
- *Risk Class: A-tailored*
- *Directed, JPL in-house implementation*
- *High heritage MSL design*
- *Modifications only as necessary to accommodate new payload and Sampling / Caching System (SCS)*
- *Planetary Protection Category V Restricted Earth Return per Level 1 Requirements*



## Science

- *Assess past habitability of an astrobiologically relevant ancient environment on Mars*
- *Assess biosignature preservation potential with the environment and search for biosignatures*
- *Assemble cached samples for possible future return to Earth*

## Technology

- *Advance technologies with applications to future human and robotic explorations objectives*

# Mission Overview



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## Mars 2020 Project



### LAUNCH

- Atlas V 541 vehicle
- Launch Readiness Date: July 2020
- Launch window: July/August 2020

### CRUISE/APPROACH

- ~7 month cruise
- Arrive Feb 2021

### ENTRY, DESCENT & LANDING

- MSL EDL system (+ [Range Trigger and Terrain Relative Navigation](#)): guided entry and powered descent/Sky Crane
- 16 x 14 km landing ellipse (range trigger baselined)
- Access to landing sites  $\pm 30^\circ$  latitude,  $\leq -0.5$  km elevation
- Curiosity-class Rover

### SURFACE MISSION

- 20 km traverse distance capability
- [Enhanced surface productivity](#)
- [Qualified to 1.5 Martian year lifetime](#)
- Seeking signs of past life
- Returnable cache of samples
- Prepare for human exploration of Mars

# Spacecraft Build Approach



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## Mars 2020 Project



### Launch Vehicle

- KSC/Launch Services Program procurement

### MMRTG

- DoE procurement to industry

### Science & Exploration Technology Investigations

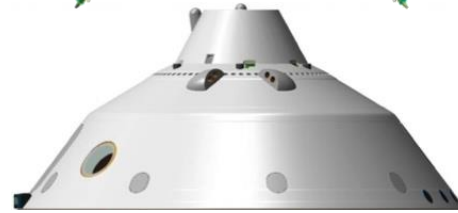
- Source per proposals via AO selection

### MEDI2

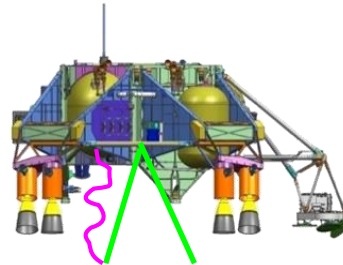
- NASA Centers (LaRC, ARC, and JPL)



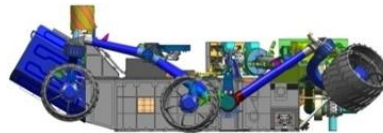
- Built in-house at JPL
- Lowest cost and risk per make-buy study and industry RFIs



- Built by Lockheed-Martin/Denver
- Procure as sole source—most cost effective



- Built in-house at JPL
- Major industry subcontracts/components
- Rebuild in-house due to criticality of EDL and rover interface

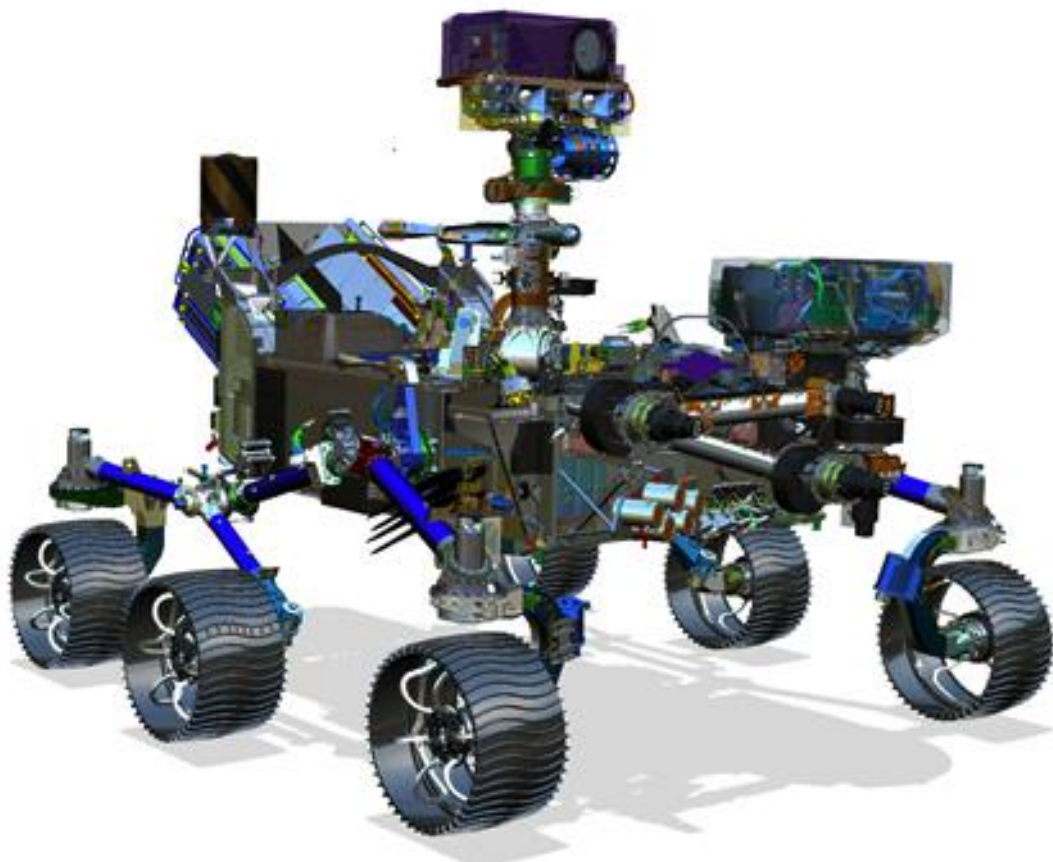


- Built in-house at JPL
- Major industry subcontracts/components
- Spanish contributed High Gain Antenna
- Rebuild in-house due to complexity of vehicle, residual hardware, criticality of EDL and rover interface, operations experience



- Built by Lockheed-Martin/Denver
- Procure as sole source—most cost effective





## High Heritage from MSL

- Avionics
- Power
- GN&C
- Telecom
- Thermal
- Mobility

## Changed

- New Science Instrument Suite
- New Sampling Caching System
- Modified Chassis
- Modified Rover Harness
- Modified Surface FSW
- Modified Rover Motor Controller
- Modified Wheels

- Preliminary Design Review completed 4 February 2016
- Project was formally approved for full scale implementation on April 27, 2016
- Atlas V 541 launch vehicle selection announced August 25, 2016
- Subsystem and Instrument CDR's currently in progress
- 3<sup>rd</sup> Landing Site Workshop scheduled February 6 – 8, 2017
- Project System CDR scheduled February 2017
- System Integration Review scheduled November 2017
- Flight System ship to KSC Planned January 2020
- Launch Period scheduled July 16 – August 4, 2020
- Landing February 2021

# Mars 2020 Mission Objectives



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## Mars 2020 Project

### ■ Conduct Rigorous *In Situ* Science

- A. **Geologic Context and History** Carry out an integrated set of context, contact, and spatially-coordinated measurements to characterize the geology of the landing site
- B. **In Situ Astrobiology** Using the geologic context as a foundation, find and characterize **ancient** habitable environments, identify rocks with the highest chance of preserving **signs of ancient** Martian life if it were present, and within those environments, seek the signs of life

### ■ Enable the Future

- C. **Sample Return** Assemble rigorously documented and returnable cached samples for possible return to Earth
- D. **Human Exploration** Facilitate future human exploration by making significant progress towards filling major strategic knowledge gaps and...

**Technology** ...demonstrate technology required for future Mars exploration

### ■ Execute Within Current Financial Realities

- Utilize MSL-heritage design and a moderate instrument suite to stay within the resource constraints specified by NASA

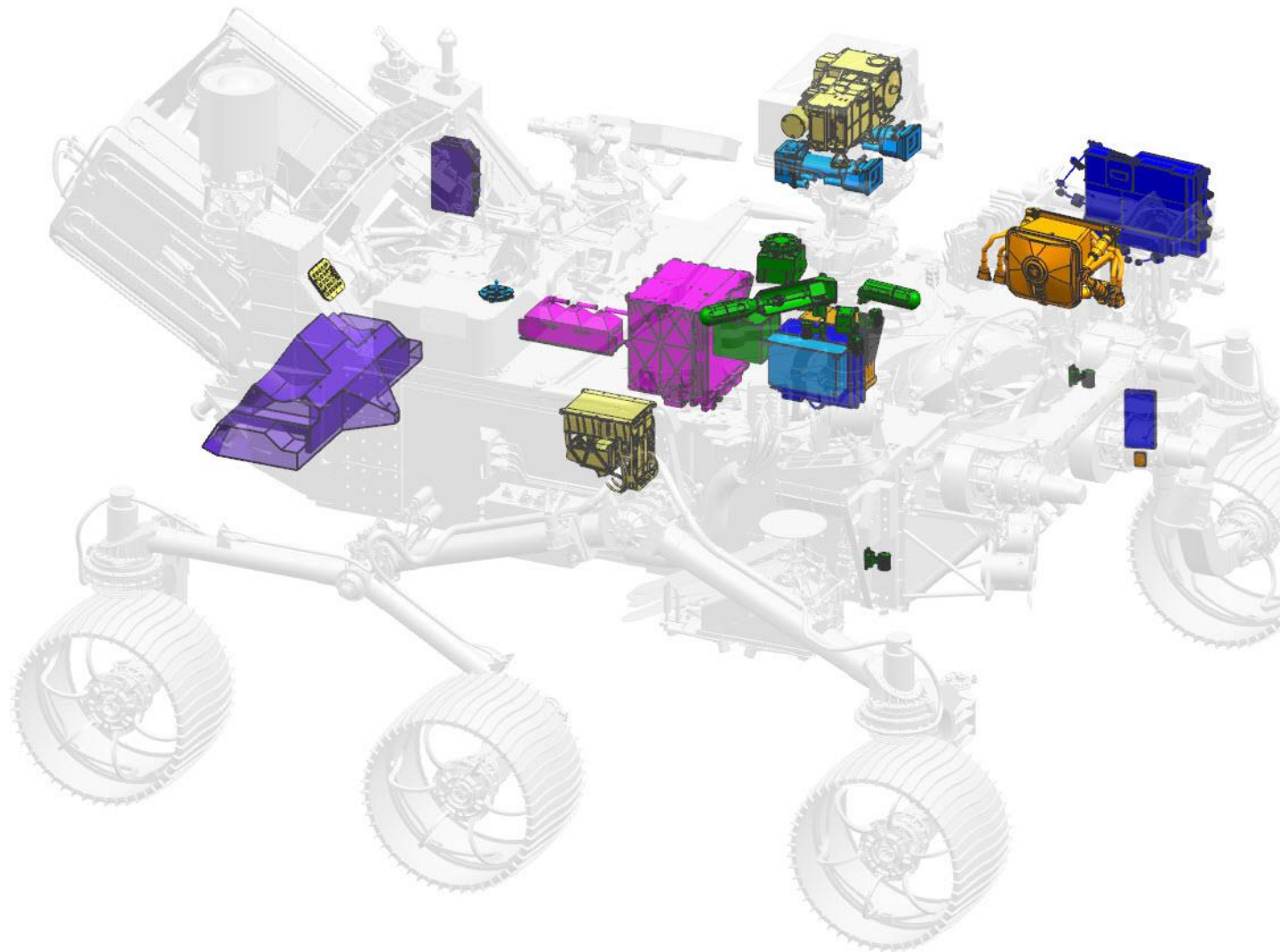
*These are a thoroughly integrated set of objectives to support Agency's Journey to Mars*

# Mars 2020 Payload Family Picture



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## Mars 2020 Project



### Instrument Key

#### **Mastcam-Z**

Stereo Imager

#### **MEDA**

Mars Environmental  
Measurement

#### **MOXIE**

In-Situ Oxygen Production

#### **PIXL**

Microfocus X-ray fluorescence  
spectrometer

#### **RIMFAX**

Ground Penetrating Radar

#### **SHERLOC**

Fluorescence and Raman  
spectrometer and Visible  
context imaging

#### **SuperCam**

LIBS and Raman

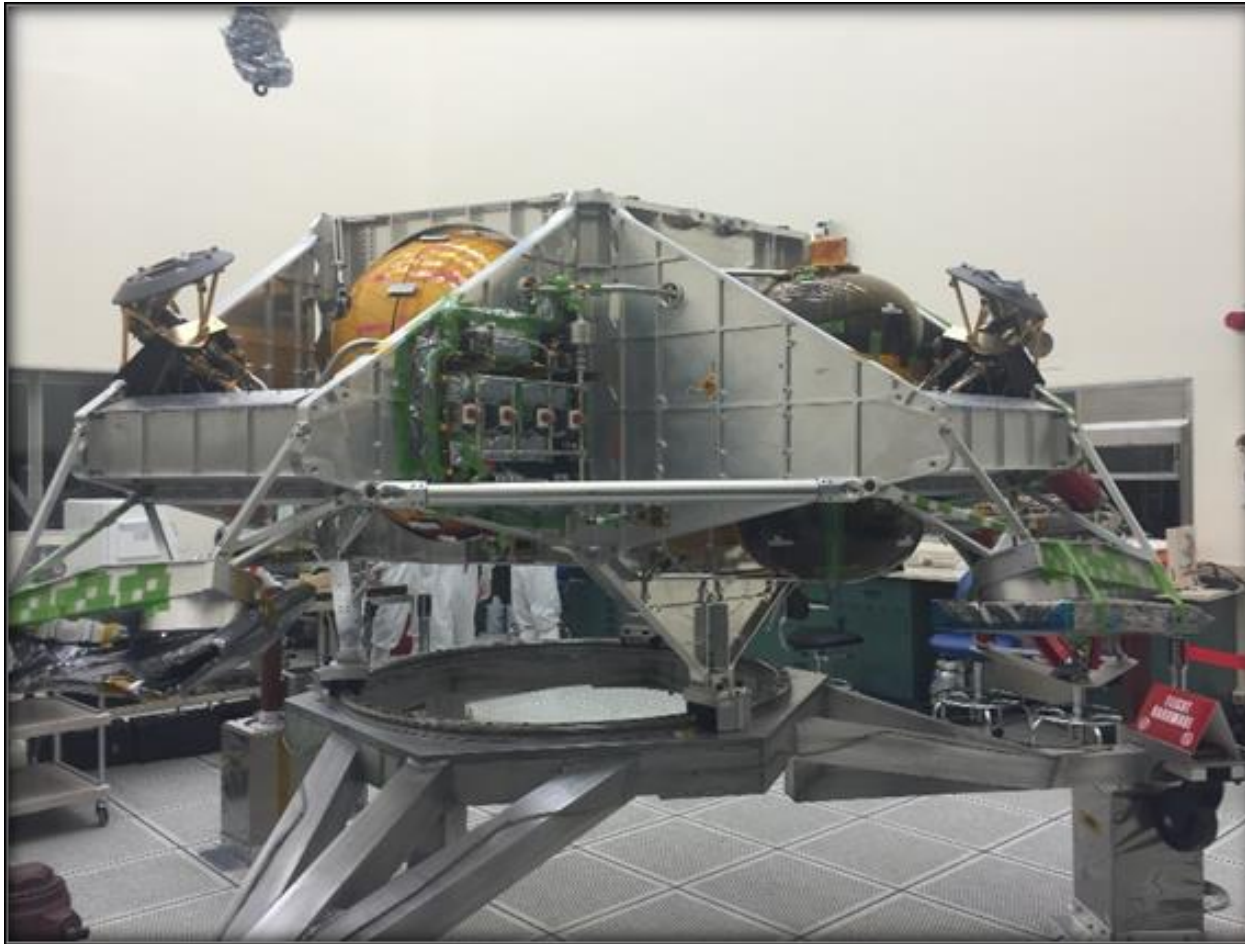


# Cruise / EDL Systems – In Assembly



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## Mars 2020 Project



- The mission design and implementation approach is fully responsive to meeting the Level 1 requirements
- The Mars 2020 Project can be executed on schedule for a 2020 launch at acceptable risk for a flagship mission within the current total life cycle cost and within the current funding profile
- Costs performance on heritage hardware continues to be on or under plan
- Cost estimates for new developments (i.e., the instrument payload and Sample Caching System) incorporated known cost growth into the baseline and provide acceptable cost and schedule margins - - payload and Sample Caching System remain critical path developments
- Successfully conducted an extensive and intensive set of instrument, subsystem, Office level PDR's, and the Project PDR
- Subsystem and instrument CDR's are in progress
- Project System CDR scheduled February 2017